Name: _____ Date: _____

3.6 Optimization Problems

1. The height, h, of a ball t seconds after being thrown into the air is given by the function $h(t) = -4.9t^2 + 14.7t + 5$. Find the maximum height of the ball and when it reaches this height.

2. Find two integers with a difference of 50 and whose product is a minimum.

3. Find two integers with a sum of 50 and whose product is a maximum.

4. Find two positive numbers whose product is 50 and whose sum is a minimum.

5. A farmer has 800 m of fencing to enclose two rectangular pens. The pens should have equal areas. What dimensions will maximize the enclosed area?

6. A resort is roping off a children's swimming area in the lake at the resort. They have 150 m of rope to use. What is the maximum area they can rope off for the children's swimming section, assuming that they do not need to run the rope along the beach side of the area?

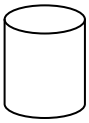
7. The cost to produce x items is given by the function $C(x) = 1200 + 8x + 0.01x^2$.
a) Write a function that represents the average cost of producing x items.
b) Use the derivative of the function from a) to find the number of items that should be produced to minimize the average cost.

8. Iesha is making a jewellery box for her mother in technology class. The top and bottom of the box will be square and made out of a wood that costs \$0.002/cm^2, and the sides of the box will be made from a cheaper wood that costs \$0.001/cm^2. Find the dimensions of the box that will minimize the cost if she wants the box to have a volume of 4800 cm^3.

9. An electronics store sells 800 LCD televisions each week when the price is \$450 each. The store completes a market survey and determines that if a \$20 rebate is offered, an additional 50 televisions would be sold each week.
a) Determine the demand function based on the number of \$20 rebates per television offered.
b) Determine a revenue function.
c) Determine the size of the rebate that will maximize the revenue.

10. A box with an open top is to be constructed from a square piece of metal that is 3 m by 3 m, by cutting out a square piece from each corner and bending up the sides. Find the largest volume that such a box can have.

11. A cylindrical can is to be made to hold 2 L of oil. Find the dimensions that will minimize the cost of the metal to make the can.



12. A piece of wire, 200 cm long, is to be bent into a isosceles triangle. What should the dimensions of the triangle be in order to maximize its area?